REMARKS

This amendment is responsive to the office action dated June 9, 2004.

Claims 1-9 were pending in the application. Claims 1-5 and 9 were rejected. Claims 6-8 were determined to contain allowable subject matter but were object to as being dependent on a rejected base claim. No claims were allowed by the Examiner.

By way of this amendment, the Applicant has amended Claims 1, 2, 5 and 7. Claim 6 has been canceled. Claims 3, 4, 8 and 9 remain unchanged.

Accordingly, Claims 1-5 and 7-9 are currently pending.

I. REJECTION OF CLAIMS UNDER 35 USC 102 – US PATENT 3,694,131

Claims 1-4 were rejected under 35 USC 102(b) as being fully anticipated by US Patent No. 3,694,131 (Stuart). The Examiner has stated that Stuart discloses a device for producing a polymer material having a continuous fiber core including: an injection molding die having an input end, an output end a material flow channel extending therebetween, a fiber feed section in the material flow channel, a cooling section adjacent the output end and a means for injecting a pressurized flow of molten material into the flow channel. The Examiner states that since the Stuart reference fully discloses each and every element of the present invention, the present invention is unpatentable.

The Stuart reference discloses an injection head that is typical of the configurations in the prior art that the present invention intends to improve. The Stuart reference provides an injection bore with a fiber feed port provided in one end thereof. The fiber is introduced into the end of the bore along the axis of the bore. The flow of molten polymer feed material is introduced into the bore at an angle that is substantially perpendicular to the axis of the bore. When injecting the molten polymer feed into the bore the first thing the flow must do is to circulate throughout the bore cavity around the fiber feed tube and then change direction by 90° in order to impregnate the fiber and flow out of the head. It is this filling process and this necessary directional change that creates enormous levels of turbulent flow within the injection molding head. This is exactly the problem identified in the traditional type molding process. Using this method

and equipment made it virtually impossible to incorporate relatively long carbon fibers into a feed stock for use at a later date in injection molding.

As discussed in the specification of the present application, the prior art methods, while attempting to incorporate the thermally conductive fiber into a base polymer matrix, subjected the carbon fiber to several highly turbulent processes while it was in its raw state. Since carbon fiber is extremely brittle in its raw state it was continuously fractured if not pulverized thereby resulting in a degradation of the fiber lengths encountered in the finished product and a degradation of the thermal conductivity of the end component. This of particular concern when palletizing, where it is desired to have the fiber run the entire length of the pellets.

It is clear from reviewing Fig. 1 in the Stuart reference that the first force imposed onto the fiber strand is a force imposed by molten polymer flowing into the fiber feed tube through the ports (17) at a 90° angle to the fiber feed direction. This geometry is precisely the problem with the prior art as identified by the applicant.

In contrast the present invention, in the claims as amended, is directed to a device for producing a polymer material with a continuous fiber core that is suitable for use as feed stock in subsequent injection molding processes. In particular the invention in the present invention is directed to providing a high quality feed stock for use in injection molding thermally conductive polymer components. In order to achieve a high quality feed stock material, it is crucial that the feed stock include continuous, relatively long thermally conductive fibers. In the context of this invention the length may be on the order of 0.25" to approximately 1.0".

The claims of the present invention as amended disclose that the molding head includes a septum that completely bifurcates the bore of the head into two separate flow channels to smooth out the base polymer flow thereby eliminating turbulence from the flow within the mold cavity. Further the claims require that the flow of molten polymer feed material be introduced in alignment with the axis of the injection bore. This combination of on axis material feed and the use of the septum wall to separate the flow

into two smaller flows serves to smooth, align and quiet any turbulence that was present in the flow of polymer material. After the flow of polymer is smoothed out, the two flow channels are brought back together at the trailing edge of the septum where the carbon fiber is then gently introduced into the flow, at the center of the flow and is drawn into the extrudate in a gentle manner thereby not stressing the fiber and subjecting it to breakage. The extrudate is then pelletized into pieces that correspond to the length of the fiber desired in the finished injection molded component.

The Stuart reference introduces the flow of molten polymer perpendicular to the axis of the bore. The claims of the present application provide a geometric configuration that requires that the flow be in alignment with the axis of the bore. The Stuart reference utilizes a circular feed tube that introduces the fiber from the rear of the bore subjecting it to turbulent polymer flow. The present invention introduces the fiber into the smoothed linear flow of polymer along the axis and in the direction of the flow. The Stuart disclosure does not include any disclosure regarding a septum wall that completely bifurcates the bore of the injection molding head. The present invention claims a septum wall that bifurcates the bore of the molding head and separates the flow of polymer material into two separate flows to assist in smoothing the flow of material before rejoining the two flows at the point of finer introduction.

Since the claims of the present application as amended include numerous limitations that are not disclosed within the Stuart reference, the Stuart reference cannot anticipate the present invention. Withdrawal of this rejection is respectfully requested.

II. REJECTION OF CLAIMS UNDER 35 USC 103

Claims 1 and 5-6 were rejected under 35 USC 103(a) as being unpatentable over Hilakos. The Examiner has stated that Hilakos discloses the entire structure of the present invention accordingly rendering the claimed invention obvious.

However, a review of Hilakos reveals that the device disclosed is a pultrusion system wherein a strand of multiple fibers are pulled through a bath of molten polymer wherein the fibers are manipulated and spread to cause a full wet out of the fibers. The

drawing force in this device is applied directly onto the fibers themselves. This is one of the drawbacks identified in the prior art that made the systems undesirable for use when placing continuous lengths of carbon fiber into a polymer material. As was stated above in connection to the arguments related to Stuart the present invention, in the claims as amended, is directed to a device that is used to produce a polymer material with a continuous fiber core that is suitable for use as feed stock in subsequent injection molding processes. In particular the invention in the present invention is directed to providing a high quality feed stock for use in injection molding thermally conductive polymer components. In order to achieve a high quality feed stock material, it is crucial that the feed stock include continuous, relatively long thermally conductive fibers. In the context of this invention the length may be on the order of 0.25" to approximately 1.0".

The claims of the present invention as amended disclose that the molding head includes a septum that completely bifurcates the bore of the head into two separate flow channels to smooth out the base polymer flow thereby eliminating turbulence from the flow within the mold cavity. Further the claims require that the flow of molten polymer feed material be introduced in alignment with the axis of the injection bore. This combination of on axis material feed and the use of the septum wall to separate the flow into two smaller flows serves to smooth, align and quiet any turbulence that was present in the flow of polymer material. After the flow of polymer is smoothed out, the two flow channels are brought back together at the trailing edge of the septum where the carbon fiber is then gently introduced into the flow, at the center of the flow and is drawn into the extrudate in a gentle manner thereby not stressing the fiber and subjecting it to breakage.

Since the claims of the present application as amended include numerous limitations that are not disclosed within the Hilakos reference, these reference cannot be relied upon to render the present invention obvious.

Claim 9 was rejected under 35 USC 103(a) as being unpatentable over Hilakos in view of Solomon. The Examiner has stated that Hilakos discloses the entire structure of the present invention except for a barrel and plunger injection assembly and that

Solomon teaches means for introducing molten polymer flow in the form of a barrel and plunger assembly and that a combination of these references accordingly render the claimed invention obvious.

However, as stated above, the claims of the present invention as amended disclose that the molding head includes a septum that completely bifurcates the bore of the head into two separate flow channels to smooth out the base polymer flow thereby eliminating turbulence from the flow within the mold cavity. Further the claims require that the flow of molten polymer feed material be introduced in alignment with the axis of the injection bore. Further, Solomon clearly teaches the introduction of the molten polymer flow at a 90° angle relative to the injection bore again requiring the polymer to change direction thereby creating turbulence.

Accordingly, since the cited references cannot be combined to render the present disclosure obvious, this basis for rejection cannot be maintained. Reconsideration and withdrawal of this rejection is respectfully requested.

III. ALLOWABLE SUBJECT MATTER

The Examiner indicated that Claims 6-8 would be allowable should they be rewritten to include all of the limitations of their respective base claims. The Applicant has amended the base claim, Claim 5 to include the allowable subject matter of Claim 6 and has accordingly canceled Claim 6 as being redundant. In view of this amendment, Applicant believes that Claim 5 and its respective dependent claims, Claims 7-9 are now in condition for allowance.

Serial No. 10/605,145

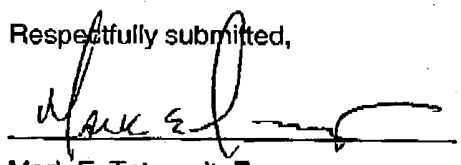
IV. CONCLUSION

Accordingly, claims 1-5 and 7-9 are believed to be in condition for allowance and the application ready for issue.

Corresponding action is respectfully solicited.

PTO is authorized to charge any additional fees incurred as a result of the filing hereof or credit any overpayment to our account #02-0900.

Respectfully submitted,



Mark E. Tetreault, Esq.
Reg. No. 48,289

BARLOW, JOSEPHS & HOLMES, Ltd.
101 Dyer Street, 5th Floor
Providence, RI 02903
(401) 273-4446 (tel)
(401) 273-4447 (fax)
met@barjos.com